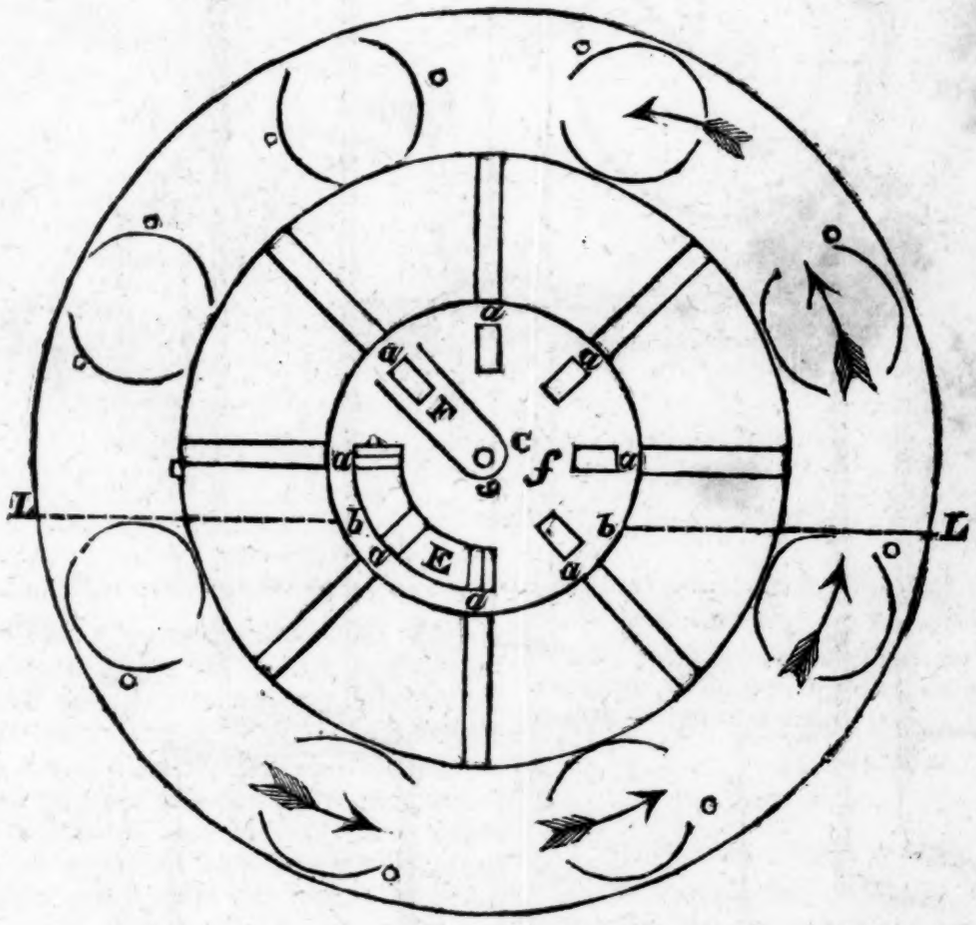
AMERICAN
MECHANICS' MAGAZINE,
Museum, Register, Journal, and Gazette.

VOL. I.—No. 25.] SATURDAY, JULY 23, 1825. [$4 PER ANNUM.

———"The charm dissolves apace;
And as the morning steals upon the night,
Melting the darkness, so their rising senses
Begin to chase the ignorant fumes that mantle
Their clearer reason." *Shakspeare.*

STEAM-AND-WATER-WHEEL.



SIR,—I have taken the liberty of submitting to your notice, and to that of your able Correspondents, a rough sketch and description of a Steam-and-Water-Wheel, which I have had in contemplation many years.

Description.

Fig. 1 is a side-view of the wheel, the rim of which is hollow; at equal distances, marked *o o o*, are openings through both sides of the wheel, into which are introduced brass cases, well fitted and secured, for brass cocks to move in. The arms of the wheel are hollow also, and into each is a separate opening, as at *a a*, communicating with the rim; the circular part, *b b*, is turned true on the face; at C is a perforation through the axis, the other end of which works in a stuffing-box at D, fig. 2, within the condenser. Fig. 3 is a strong brass washer, turned true on the face and edge; at E there is an opening

quite through; the space marked at F is only an indentded archway, through which (when the washer is brought against the face of the wheel to the corresponding dotted spaces and letters) the steam escapes into the condenser. The round metal box, G, fig. 2, is turned true on the inside, and into it is introduced the above washer, which is closed against the face of the wheel by screws through the back side of the box, communicating with the boiler by pipe P. At RR are flanches on the box, G, and also on the wheel, at I; into a recess, against the wheel, a skin is pressed by a hoop-plate round the box, G, by screws through the flanch on the box, to secure the face air-tight. At fig. 4 are the hand-geering. Instead of water, I propose making use of oil, as there is no waste. U, fig. 2, is a cistern containing oil, by sending the fluid to or from which the machine may be regulated to different powers; the cocks on the edge of the wheel will empty into the cistern, and by the same means steam may be put into the wheel. At X, fig. 2, is a tooth-wheel, round which is a brush, similar to a wind-mill.

Fig. 3.

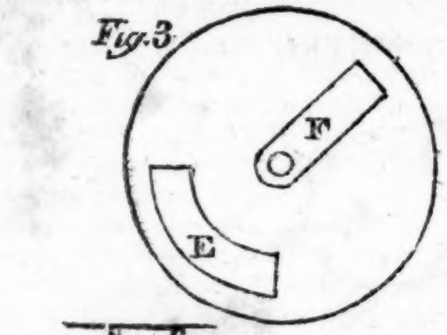
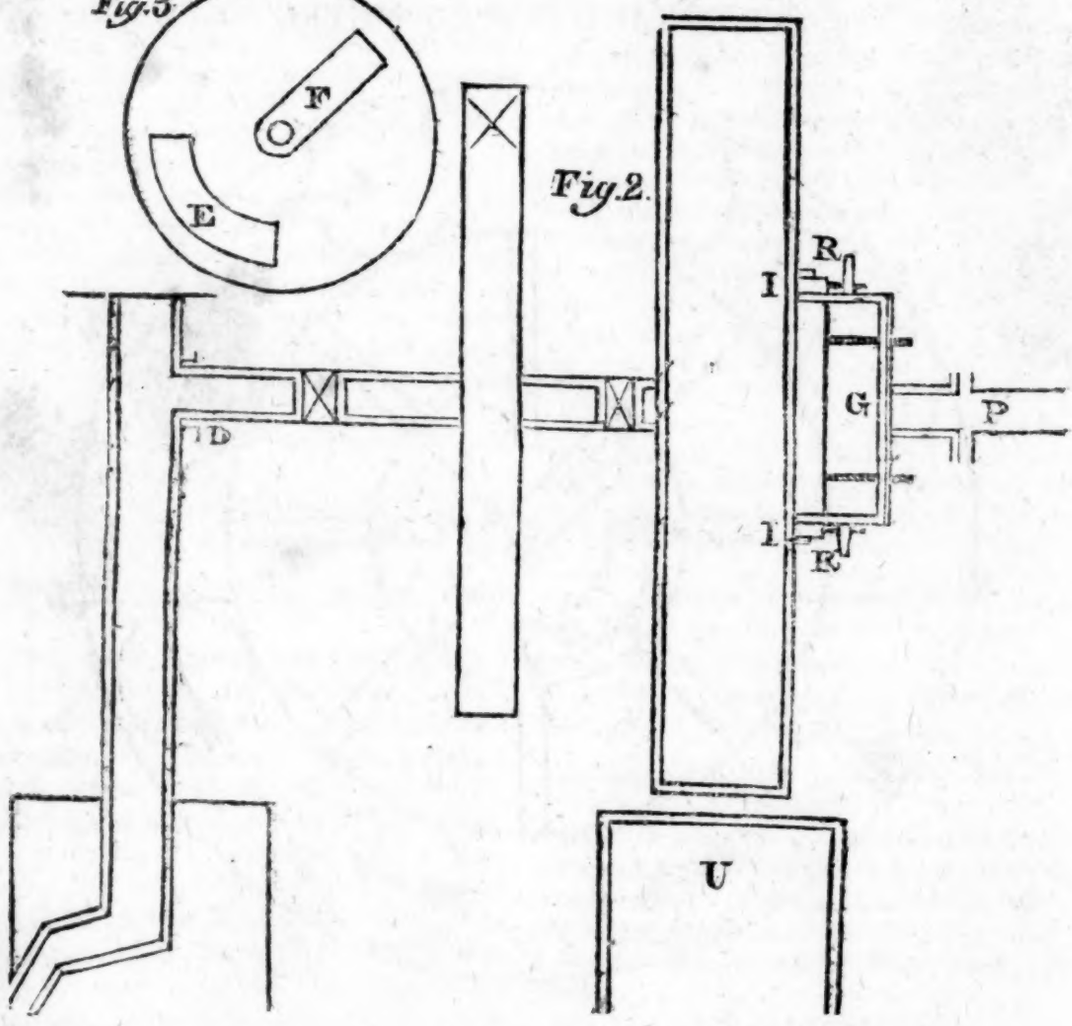


Fig. 2.



The operation is as follows:—Supposing the machine to have been at work, all the cocks would be shut on the rising side, which must now be opened; slide back the guide-plate at Y, fig. 4, and open the cocks, and the whole space on the top of the wheel above the fluid, marked by a dotted line, LL, fig. 1, will be open: put on the steam, and open the cocks on the edge of the wheel, to let out the air; close the cocks, and condense the steam. There is now a vacuum formed in the top of the wheel; close the cocks at Y, fig. 4, and adjust the guide-plate; again put on the steam, and the fluid will rise in the wheel in the direction shown by the arrows; open the condenser and take off the brake; the steam will now press the fluid in succession into the vacant spaces in the top part of the wheel, where a vacuum is regularly forming, as they pass the opening to the condenser on the rising side. I conceive

the friction to be trifling to what one might imagine from a superficial view, by reason of those parts being constantly enveloped with oil. I calculate upon a very slow motion, not to exceed a space of one foot per second.

Your obedient humble servant,
A YORKSHIRE MILLER.

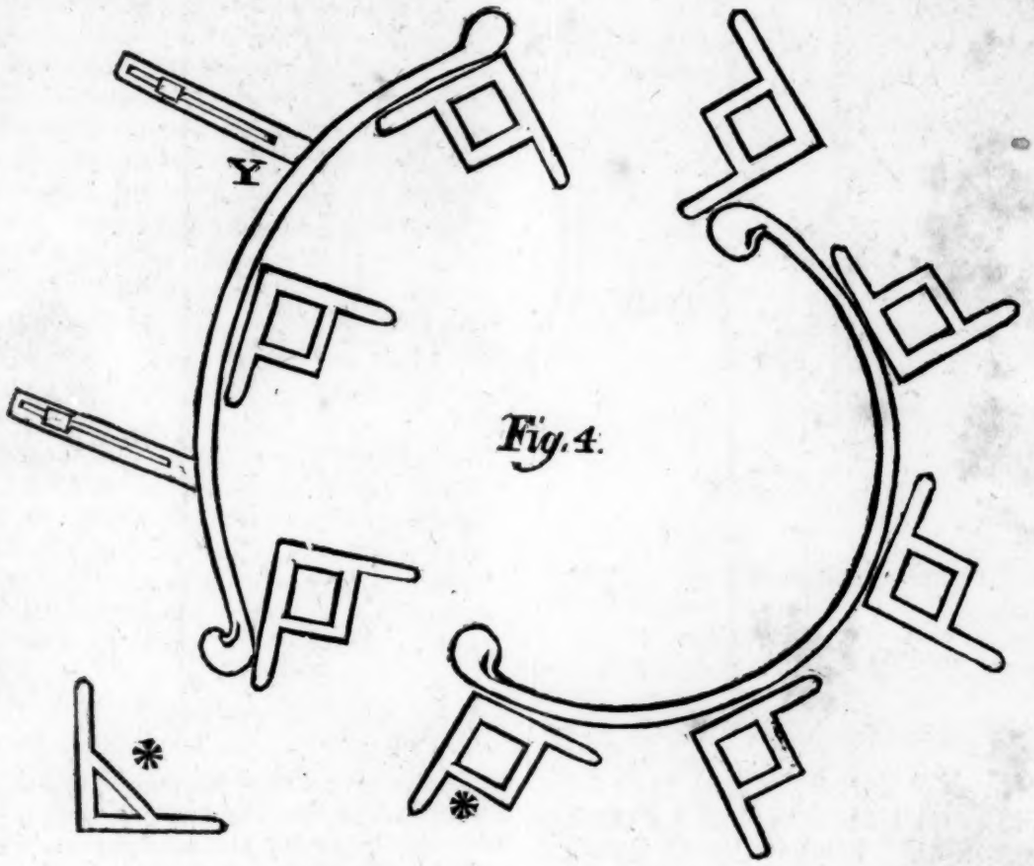


Fig. 4.

WEIGHTS AND MEASURES.

"Take a pendulum which will vibrate seconds in London, on a level of the sea in a vacuum; divide all that part thereof which lies between the axis of suspension and the centre of oscillation into 391 393 equal parts; then will ten thousand of these parts be an imperial inch, twelve whereof make a foot, and thirty six whereof make a yard.

"Take a cube of one such inch of distilled water, at 62° of temperature by Fahrenheit's thermometer; let this be weighed by any weight, and let such weight be divided into 252. 468 equal parts; then will one thousand of such parts be a Troy grain, and seven thousand of these grains will be a pound of avoirdupois, the operation having been performed in air Ten pounds such as those mentioned of distilled water, at 62° of temperature, will be a gallon, which gallon will contain two hundred and seventy-seven cubic inches, and two hundred and seventy-four one-thousandth parts of another cubic inch."

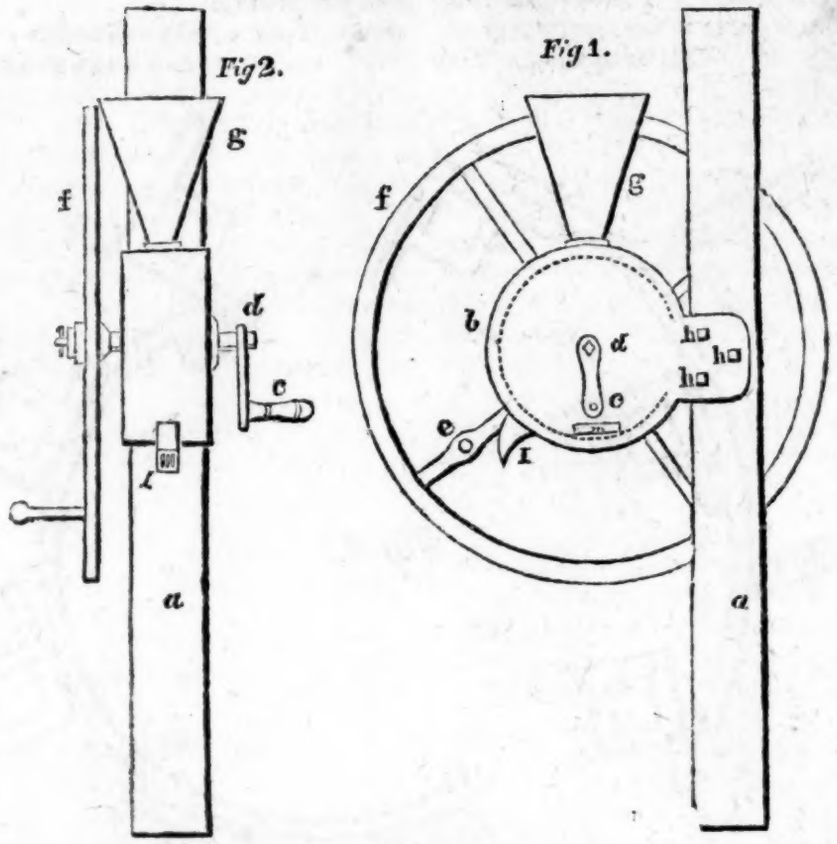
Lond. Mec. Mag.

WOOD LIES UNDER WATER.

Take two pieces of wood, planed perfectly smooth, so that no water can get between them when their smooth surfaces are put together:—cement one of the pieces to the bottom of a glass vessel, so as to have its smooth side uppermost; then place the other piece above it, and hold it in this situation till the vessel is filled with water, and it will be found to lie at the bottom as quietly and firmly as if it were a piece of lead or stone.

London Chemist.

PORTABLE HAND-MILL.



SIR,—A Correspondent asks for a "Plan and Description of a Portable Hand-Mill. I beg leave to forward one, which is very simple in its construction, and not likely to be injured in travelling. I have had an opportunity of seeing it used with success for several years without requiring any repair. Your Correspondent desires that it might take up but little room; this, however, is hardly to be expected without a considerable augmentation of labour in grinding, as the only part that could be dispensed with is the wheel, instead of which a second handle might be substituted precisely similar to that marked C.

Description.

Fig. 1. represents a side elevation; Fig. 2, a front elevation of the mill; *a* is an upright, to which the body, *b*, of the mill is fixed by means of the screw-bolts, *hhh*; *c*, a handle attached to the spindle, *d*, which passes through the body of the mill; *e*, another handle fixed to the wheel, *f*, which revolves on the extremity of the spindle, and serves to facilitate the turning of the mill; *g*, the hopper; I the valve; *m*, a small door, for the purpose of occasionally removing the bran which may accumulate in the interior. It will take entirely to pieces, and occupies no very considerable space.

The one from which this drawing was taken, was purchased in London, a few years since, at a trifling expense; but, as I have forgotten the name of the maker, I can give no information to your Correspondent on that head.

I am, Sir,
Your obedient servant,
W. H—S.

Lond. Mec. Mag.

PEWTERER'S SOLDERING FURNACE.

The Pewterers have long been in the habit of employing *a blast of hot air*, for the purpose of heating and soldering the various parts of their articles together with soft solder, and with very great convenience indeed; the blast of air being quite clean, and not discolouring the parts with smoke, soot, &c.

The small furnace employed for this purpose is of a round or oval

shape, and is formed of an exterior case of sheet or cast iron, lined with fire-bricks or tiles and clay. It is fed with charcoal, and the air from a pair of bellows is made to enter by an iron pipe on one side of it, so as to pass through the burning coals, and to escape through another iron pipe, on the opposite side, above, in the heated state. The parts to be soldered, having a little oil previously applied to them, are to be held in the steam or hot air, until they become hot enough to melt a thin slip of soft solder held to them, which flows between, and unites the parts firmly together.

The fusibility both of the pewter and of the solder is so nearly alike, that a very little excess of heat would melt the pewter articles, and workmen are, accordingly, sometimes obliged to wet them instantly on the solder flowing, in order to prevent that mischief.

This ingenious contrivance is, no doubt, capable of being used for many other purposes; and, indeed, a very valuable application of *a stream of hot air* has been lately made by Mr. Bryan Donkin, civil engineer, who has taken out a patent for dressing net-lace, &c. by means of it.

Lond. Mec. Mag.

WHITENING BRASS WORK.

Brass work boiled with tin shavings, a few grains of tartaric acid, and an equal quantity of orgal with soft spring water, in a brass kettle, will become white. The brass should be kept covered with water, and suffered to boil about half an hour, till the colour required is obtained, and then immersed in cold water immediately, and washed off. The solution will be good for three or four times, by adding each time a little more of the acid, but is highly poisonous.

Lond. Mec. Mag.

SQUARING NUMBERS.

SIR,—Observing in your valuable Work, a short method of Squaring any given Number, I have taken the liberty of sending you another, by the insertion of which you will greatly oblige, sir,

Your obedient servant,

G. MORLEY.

Richmond-street, Wolcot-place, Lambeth.

I have taken the same example.

47653843

16 . .
609 . .
5676 . .
47625 . .
285009 . .
7624544 . .
38123056 . .
285923049 . .

2270888752668649

Observe, the first figure is squared;—then the second line is found by squaring the next figure, and multiplying all the remaining figures to the left of it by its double.

Each figure is removed two places towards the right hand.

Example.—4×4=16, first line.

7×7=49; set down 9, and carry 4.—The double of 7 is 14.

14×4+4=60; set down 60, which is equal to 609, second line.

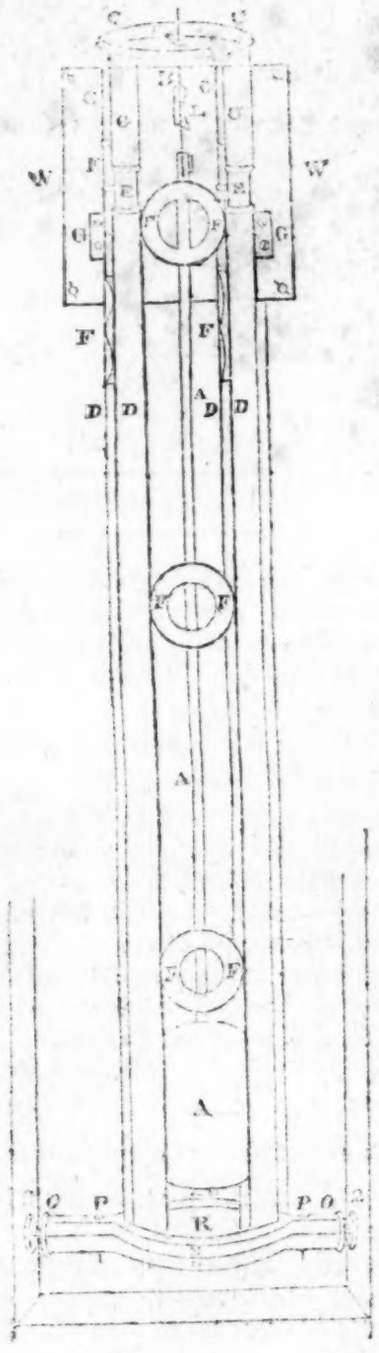
Third line: 6 times 6=36; set down 6 and carry 3; then twice 6 is 12; 47×12+3=5676; and so on till the end.

Lond. Mec. Mag.

SELF-REGULATING PENDULUM.

SIR,—I am induced to lay before you the particulars of an invention, I believe an original one in its conception and application, simple in its principle of operation, and effective in producing the very important and desirable object of attainment to the scientific world, *an accurately Self-Regulating Pendulum.* If I am in error upon the subject of its originality, it will give me pleasure to be set right by any of your better informed Correspondents, who will state the particulars of any published invention similar in principle and application to mine. Prefixed, I send you an outline, indicating the parts with sufficient precision, I believe; but not being a

professor of the pencil, or graver, you must overlook any slight inaccuracies in the sketch.



Description.

AAA, pendulum, weight, and rod; B, pendulum spring; CC, &c. a ring of brass, one-fifth of an inch in diameter, round; to this ring, at equal distances from each other, are welded four brass sockets, (also CC, &c.) one quarter of an inch or more in length, of exactly sufficient width in their bore through their centre, to admit rods of similar size to the pendulum rod to pass up to their points of junction with the brass ring, C. DDDD, four corresponding sockets, fixed (as hereafter shown) at the bottom, and of sufficient length to approach to within half an inch of the extremities of the upper set of sockets just described, when the four rods seen at EEEE, of the same diameter, and taken from the same coil, as the pendulum rod, have been pushed home to the bottom of the sockets, and the upper sockets and ring have been slipped down upon the upper extremities of those rods, which latter, of course, will then be of equal length, and half an inch more, to both sets of sockets. FFF, &c. rings of brass welded firmly at the sides to the opposite sockets; two at the top, also marked F, are seen in perspective (more than these two cannot be distributed at the two sides, as the swing of the pendulum would be prevented.)—These rings are to assist in keeping the lower sockets in their proper positions with respect to each other. GG, two brass plates welded to the back of the sockets next to the clock, and screwed firmly to the back of the latter. K, a cross-bar through the centre of the brass ring, C (before described;) in the centre of this bar is a slit, through which the top of the pendulum spring passes, half an inch above it, and is then screwed tight by a screw passing horizontally through the centre of the cross-bar. L, the crutch of the escapement in its proper position at the back of the clock, WW, with the pendulum spring inserted. NN, two brass rings, one quarter of an inch square each throughout their circumferences, with shanks at each side of the same square.—OO, brass caps, to fasten the extremities of the shanks of both rings together, to which they are screwed. PP, screws passing perpendicularly through the centre of both the shanks, and fastening the rings and shanks together. QQ, circular brass plates, to the centre of which, by a shank proceeding from the centre of the caps just named, the brass rings and shanks are fixed in a perfectly horizontal position. These plates are screwed to the sides of the clock-case by screws, at equal distances, all round their circumferences. R, a thin brass circular plate, seen in perspective at this point. This plate is of rather greater diameter than the brass rings, NN, between which it is fixed, and screwed tight by the means before named. The bottoms of the sockets, DDDD, are firmly welded, or screwed, or otherwise fastened to this plate, at equal distances from each other, corresponding in their position with the upper set of sockets fastened to the brass ring, CC.

The mode of adjustment of a similar apparatus to any description of common pendulum, I shall give at the conclusion. I now proceed to explain the operation and uses of the several parts.

Mode of Operation.

The four rods, EEEE, are put into the lower perpendicular sockets, and pressed quite home to their point of junction with the brass supporting plate, R. This must be particularly attended to. The sockets attached to the upper brass ring, CC, are then slipped upon the upper extremities of these rods, quite home also. The pendulum spring is now slipped up through the crutch of the escapement, and the head passed through the slit in the cross-bar at the top, and half an inch above it, and then screwed firm by the horizontal screw to its centre. Now it is evident that as the pendulum rod expands or contracts, by the variations of the temperature of the atmosphere, the four perpendicular rods of the same diameter and material, and taken, as before said, from the same coil as the pendulum rod, and of ascertained length, (of which hereafter) will be equally affected. These rods meeting a greater resistance to their expansion at their lower extremities from the brass plate, R, inserted between NN, than their upper extrimities receive from the brass ring and sockets, CCCC, and the pendulum thereby suspended, and being prevented from expanding laterally by the surrounding and closely fitting brass sockets, the whole effort of expansion will consequently be accumulated and take effect at the top, and raise the pendulum weights by the head of the spring, exactly so much as the pendulum rod is, in reality, lengthened by the increase of temperature; and the contraction of the rods, in equal proportion with the contraction of the pendulum, will, on the other hand, let the pendulum weight down, as far from the point of suspension as it would otherwise have been brought nearer to it; or, in both cases, keep the weight of the pendulum at exactly the same distance from the point of suspension as it was fisrt adjusted to; forming a self-regulating pendulum of the greatest accuracy.

Mode of Adjusting the Regulating Rods.

Having obtained a pendulum rod of the proper length, with weight affixed, take from the same coil another, or as many as you please, of two or three inches longer, to allow for such alteration in their length as may be found necessary; suspend them together by the same horizontally fixed wire, and expose them all together to different degrees of temperature. If the expansion is greater in the rods than in the pendulum and rod, reduce the former very gradually in length, until the requisite equal proportion is accurately obtained.—Select four (equal in length) for regulating rods: two, or even one would do; but the uniformity and effect of the action of four, at equal distances from each other, and from the point to be acted upon, will be more correct, as regulating each other; and in increasing the power to form rods, it must be remembered that the degree of expansion remains unchanged.

To ascertain whether rods of the same diameter, and from the same coil, possess similar expansive properties to each other, take exactly equal lengths of such wire: weigh them; if they weigh exactly equal, their expansive properties will be found the same.

Wishing to preserve, through the record of your publication, my claim to the originality of this invention, and to the peculiar application of the power employed to produce the effect explained, I shall feel gratified by your insertion, in an early Number, of this statement. I have already occupied too much of your time and my paper, to explain more at large the details of my plan, and shall therefore reserve such explanation for any of your readers who may require information upon the subject, which I shall always be ready to afford with great pleasure. Purposing, with your approbation, to continue my communications to you on other subjects on future occasions.

ROBERTUS HIBERNICUS.

Lond. Mec. Mag.

ON WOOTZ, OR INDIAN STEEL.

On analyzing wootz, or Indian steel, only a minute proportion of the earths alumine and silex can be discovered in it. These earths, or their peculiar metallic bases, seeming to give this kind of steel its peculiar qualities, many attempts were made by Messrs. Faraday and Stodart to make such a combination of metal. The most successful was the following:—

Pure steel, and in some cases good iron, being mixed with charcoal dust, was melted. The metal thus obtained had a very dark gray colour, resembling the black tullerium ore, and a very coarse crystaline grain; for when small buttons, weighing little more than an ounce, were broken, the crystalline faces of the grain were frequently an eighth of an inch wide.—This kind of carburet appeared an identical kind of substance, for it was uniformly composed of 94 parts and one-third of iron, and 5 parts and two-thirds of carbonaceous matter.

When this carburet is ground to powder in an iron mortar mixed with as much of the earthy powder called pure alumine, and melted together, a white metal was obtained, of a close granular grain, and very brittle. This metal, on examination, was found to contain six parts and nearly a half of alumine, in each hundred, along with some carbon, which was not accurately estimated.

700 parts of good steel, melted with 40 of the alumined steel, obtained as just mentioned, produced a metal that could be worked under the hammer; and which, on being forged into a small bar, and having its surface polished, exhibited, on being acted upon by weak spirit of vitriol, that beautiful damask, which appears on wootz when exposed to the action of the same acid liquor.

A second experiment, in which 500 grains of fine steel were melted with 67 of alumined steel, produced a metal which forged well, gave the damasked appearance, and appeared perfectly similar to Bombay wootz.

Wootz, or Indian steel, although repeatedly melted, retains its power of presenting a damasked surface when forged, polished, and acted upon by a weak acid. This appearance is seemingly produced by a dissection of the crystalline grain by the acid, so that although by the hammering the crystalline grain has been bent, yet their forms may be readily traced through the curves which the twisting and hammering have produced.—From this uniform appearance of damask on the surface of wootz, it is highly probable, that the much admired Damascus sabres (from whence this term damasking derives its name) are made from this Indian steel. It is indeed true that a damask surface may be produced by welding together iron and steel; and Weigleb gives this method of making Damascus sabres,—by first welding together a number of plates of iron and steel, placed in alternate order, then twisting them, and, lastly, welding together two plates of this twisted compound metal, with a plate of fine steel between them, to form the edge of the sabre, while the twisted plates will give the damask.

The damask on wootz cannot be the effect of the mechanical mixture of iron and steel unequally acted upon by the acid, for it may be melted without loosing this property. The superiority of wootz, in showing this effect may fairly be considered as depending on its power of crystallising, on cooling, in a more marked manner than common steel.

Lond. Mec. Jour.

ON BRINE FOR PICKLING.

Brine, containing about 20 parts of common salt, dissolved in 80 parts of water, which may be known by its specific gravity, being, to that of water, as 1155 to 1000; so that a bottle holding ten ounces of water will hold eleven and a half of the brine, is not sufficiently strong to cure animal matter soaked in it with any certainty.

Brine, containing about 24 parts of common salt, dissolved in 76 parts of water, which may be known by its specific gravity being, to that of water, as 1180 to 1000; so that a bottle holding ten ounces of water will hold eleven ounces and three quarters of brine, may be used for curing meat or fish in temperate weather.

Brine, containing about 28 parts of common salt, dissolved in 72 parts of water, which may be known by its specific gravity being, to that of water, as 1200 to 1000; so that a bottle holding ten ounces of water will hold twelve ounces of brine, may be used for salting meat in the hottest weather.

The lower part of a brine is always stronger than the top. The best way to preserve the strongest brine in a uniform state is to place a large lump of solid salt upon the top layer of meat or fish: for then, as the salt dissolved in the brine falls down to the bottom, the weakened brine at the top slowly dissolves this lump of salt and is kept at its full strength.

Lond. Mec. Mag.

ON MELTING AND WELDING STEEL WITH PLATINUM.

Equal parts of steel and platinum melted together, by Messrs. Stodart and Farraday, produced a beautiful metal, taking a fine polish, and not apt to tarnish. Its colour is the finest imaginable for a mirror.

90 parts of platinum melted with 20 of steel, also produced a metal which has no disposition to tarnish.—It is very obedient to the hammer.

10 parts of platinum and 80 of steel produced a metal, which ground to a very fine polish, but had a fine damask, so that it was quite unfit for the purpose of a mirror.

The best proportions of platinum to improve steel for cutting instruments, are from one to three parts of platinum in proportion to the hundred of steel. The metal from platinum melted with steel is so little subject to tarnish, that after laying many months, it had not a single spot upon its surface.

Wires of platinum and steel of about equal diameter, packed together, were perfectly united by welding; which was effected by a skilful workman with the same difficulty as could have been done with steel or iron. On being forged, the surface polished, and the steel slightly acted upon by water soured with oil of vitriol, the mixed metal presented a very beautiful surface, the steel and platinum forming dark and white clouds. With very fine wires, a damasked surface of exquisite beauty would be obtained.

Lond. Mec. Jour.

ON PATTERNS FOR CASTINGS.

Mr. Gill has observed that patterns for casting may be far better made than in the common mode, in several methods.

Patterns of a circular form may be formed by moulding a circular cake of plaster of Paris upon a plate of wood or metal capable of being fixed upon the mandril of a lathe, and turning it into shape; then taking it off, cementing the turned face upon the plate, and turning the other face into shape. These patterns are thus readily formed, and when soaked in boiled linseed oil, are excellent patterns, not liable to warp by the moisture of the sand. Common square patterns may be made of wood, which must be defended from warping in the moist sand by several coats of paint; or, which is still better, and must be adopted in fine work, as for the mathematical instrument makers, or when the patterns are to join others, the models must be formed in mahogany, and then varnished with spirit varnish, which will effectually preserve them from warping by the moisture of the sand.

Lond. Mec. Jour.

ON SOLDERING THIN SHEET IRON WITH CAST IRON.

When the filings of soft cast iron are melted in a crucible with borax, which has been previously calcined, in order to get off the water it contains, a hard, shining, black, pitch-like soldering substance is obtained, being glass of borax coloured black with iron.

Sal ammoniac having been applied to the internal joining, or between the over-lapped edges of thin sheet iron, some of this black solder being powdered, is to be laid along a short portion of the joint, and as soon as it is melted over a clear forge fire, the soldered part is to be placed on the back of an anvil, and beaten with a light hammer and quick hand, as long as the heat permits. More of the powder is then to be laid upon the adjoining part of the joining, until the whole of the seam is soldered.

This is justly considered as a valuable process, and is attempted to be kept a secret.

Lond. Mec. Jour.

ON FULMINATING QUICKSILVER, AS A PRIMING FOR PERCUSSION GUN LOCKS.

Mr. Wright, of Hereford, observes, that the oxymuriate of potasse rusts the lock, chamber, and breech of the gun, to an astonishing degree; and the dirt created by the charcoal in Forsyth's and other magazine locks, is another serious inconvenience.

The fulminating quicksilver requires a harder blow to inflame it than the mixture of oxymuriate of potasse and brimstone; besides which, it is not liable to spontaneous explosion. The sportsmen in his neighbourhood, who have tried it, give it the preference to the common percussion powder. It is only suspected that it will wear the nipples on which the caps are placed faster than the common powder; but this might be obviated by making the inner part of the nipple of platina.

The principal objection to the use of fulminating quicksilver is, that it is not yet commonly sold either by gunsmiths or the ordinary chemists and druggists.

Lond. Mec. Jour.

ON THE MODE OF PREPARING ISINGLASS IN RUSSIA.

Professor Petri, of Erfurt, has recently published some interesting observations on these subjects, from which it would appear that the fishery is one of the most fruitful sources of revenue to the Russian empire.—Some idea of the importance of this article of revenue may be entertained, when it is considered, that from Petersburgh alone there are annually exported more than 6000 puds, or about 217 tons of two of its products, isinglass and caviare, which are brought from the provinces in the interior country, and principally from those bordering on the Volga and the rivers which pour their waters into the Caspian Sea.

Besides the great sturgeon, *acipenser huso*, several other fishes are employed for the manufacture of isinglass. From the swimming bladder of the first more especially the best is prepared; the most common sort is that made from the intestines and side fins of the others. A mixture of these different kinds of isinglass, or rather a mixture in the preparation of the substances that furnish them, gives occasion to differences in the quality, and consequently to variety in the price.

Isinglass is prepared by washing and macerating the membranes.—This process is necessary, in order to separate the internal membrane, which is detached under the form of silvery layers, which are dried apart: the others are also dried separately; the glues which they yield being more or less impure. On the Volga, all these membranes are boiled in water, so as to form a fish glue, which is dried and formed into different shapes. In other places the membranes are beaten before boiling.

The flesh of the great sturgeon, the dimensions of which are enormous, is frozen and forwarded on sledges to Moscow and St. Petersburg, where it is sold in the markets, in shapeless masses which might be taken for blocks of snow or ice.

Lond. Mec. Jour.

DR. EDMUND CARTWRIGHT.

Dr. Edmund Cartwright was born at Manham, in Nottinghamshire, in April, 1743, and educated at Wakefield, in Yorkshire. He was the younger brother of Major Cartwright, of political celebrity; and entering the church, retired into the country, where he resided for some years on a small family living, and soon became celebrated as a poet. In this retirement he made a most important discovery in medicine—the application of yeast to putrid fevers.

Having, in 1772, married a young woman in Doncaster, he, after some years, went to live there—and now

his mechanical genius began to develope itself, and he invented a loom which was worked by machinery. A manufacturer at Manchester contracted with him for a number of these looms, which were destroyed by a lawless mob within a month after they had been erected. But, although Dr. Cartwright thus reaped no immediate benefit, weaving by machinery has triumphed over the opposition made to it.

His next important invention was a machine for combing wool; which caused such an alarm, that, in 1793, the whole body of wool-combers petitioned Parliament to suppress these machines. These petitions were disregarded; but his patent was invaded, and it was not till 1803 that his claim to the invention and patent was established, and he obtained, against one of his opponents, a verdict of 1000 pounds, after a trial which lasted 26 hours.

After it was supposed that Mr. Watt had brought the steam engine to the utmost limits of perfection, Dr. Cartwhight found it still had defects which might be remedied. His first object was to obtain, as near as possible, an absolute vacuum. He therefore performed the condensation by the application of cold to the outside of the vessel containing the steam.—This idea had indeed been frequently tried, but with so little success, that one of the first engineers gave it as his opinion that if a steam pipe was laid across the Thames, it would not condense the steam quick enough for the purposes of the steam engine.—Dr. Cartwright got over this difficulty by admitting the steam between two metal cylinders, lying one within the other, and having cold water flowing through the inner cylinder, and enclosing the outer cylinder; by which means he obtained his object. He also introduced a metallic spring piston, which has since been universally adopted.

These were not all the mechanical improvements which Dr. Cartwright introduced They were much more considerable; and indeed Parliament so highly appreciated his services in this line, and which his clerical profession prevented his making the full use of, that they voted him a grant of 10,000 pounds.

This venerable mechanic invented a vehicle intended as a substitute for horses, and often astonished the natives of London by working and steering his carriage through the streets. He expressed himself with great confidence, that this child of his old age would come into general use, and that carriages of every kind would in a few years travel the road without the aid of horses.

He was busied to the very end of his life in mechanical pursuits; and, almost in his last moments, expressed a confidence that the invention of a new power for moving machines, by means of gunpowder, would be successful.

Lond. Mec. Jour.

APPEARANCES OF METALS ON THE CUPEL.

Mr. Chaudet published a set of experiments on the appearances of the most usual metals when exposed to fire, upon a cupel of bone ash, and how the natural or artificial mixture of the other metals with tin may be ascertained.

Pure tin becomes covered with a grayish black oxide, increases much in bulk, then exhibits the appearance of combustion, and at last leaves a red coloured oxide, which, on cooling, becomes first yellow, and lastly white.

Antimony becomes first black, then melts, resuming its metallic splendor and allowing a vapour to fly off. The whole metal is volatilized in a white smoke, leaving yellowish and reddish spots on the cupel.

Zinc melts, blackens on the surface, takes fire all of a sudden, and burns with a very brilliant greenish white flame, giving out a white smoke; the oxide is gradually elevated into a cone. When removed from the fire it is at first greenish, but, on cooling, becomes snow white,

Bismuth soon melts, and is covered with a sort of oxide, which melts likewise. A small portion of the oxide sublimes: the rest sinks into the

pores of the cupel, leaving it of a fine orange yellow colour, with some spots of green.

Lead exhibits exactly the same phenomenon, and differs from bismuth merely in the colour which it leaves on the cupel, which, when lead is used, is always a lemon yellow, becoming pale and dirty by exposure to the air.

Copper assumes on its surface different oxidescent shades, which succeed each other with rapidity; leaving at last a coating of black oxide, which is detached as the metal cools. If the furnace be hot enough, the metal melts and is soon covered with a coating of black oxide.

When tin is contaminated by iron, the presence of this metal becomes manifest by the spots of rust with which the white oxide is tarnished, after the metal has been exposed on the cupel.

The presence of a quarter per cent. of antimony in tin may be recognised, by the grayish black spots with which the white oxide of the metal is mixed, after exposure to the fire, on the cupel.

When a small quantity of zinc is mixed with tin, the tin loses the property of burning, by covering itself with irradescent points, which happens when the tin is pure. The oxide when cold, has a shade of greenish gray, even when the zinc does not exceed one per cent.

Bismuth alloyed with tin, even when the proportion does not exceed one-twentieth part, gives to the oxide a grayish colour mixed with yellow; or, if it does not exceed one part in a hundred, merely a grayish colour.

Less than five per cent. of lead may be detected in tin, by the rust colour which it communicates to the oxide of tin.

Less than one per cent. of tin can be detected in lead; because the lead, in that case, when exposed on the cupel, remains tarnished, and exhibits on its surface small quantities of the oxide of tin.

When tin is alloyed with a few hundred parts of copper, this last metal may be distinguished on the cupel by the rose-red colour which it produces.

Lond. Mec. Jour.

CLOCK WITHOUT WHEELS.

SIR, From the effects of custom and the association of ideas, they returning daily in the same order, it rarely occurs in the ordinary concerns of life, that more than a superficial review of things is taken by the mind at the mention or even sight of what daily comes under notice, although much science and great ingenuity may be connected with it. Thus the barometer is hung up in almost every house, and constantly inspected by thousands, who are no more excited to inquire after its cause and modes of action, than about the circulation of the blood in their own body; they consider it, and all that belongs to it, but unity of material, as much as the poker at the fireside. The clock, in like manner, has its machinery treated as almost a hidden mystery, or as if it had the power of creating time by its wheels: the cumbersome weights, which are the life and power of the whole scarcely ever inducing one rational idea to be passed upon them, or other than that the clock will not go without them.

Now, sir, I wish to call the attention of some of your ingenious readers and writers on mechanics, respecting these same neglected weights, to know from them if it be not possible to do away with Messrs. Wheel, and Co. altogether.

The principle I go upon is, that any thing in a state of constant and uniform motion indicates time, however clumsy its construction may be, as well as the most delicate and sightly piece of mechanism. The equal and alternate motion of a rocking stone, were it possible for one to move of itself, could not be exceeded as a time-keeper by the best chronometer; and, as power and motion are always coincidental, indices could always be attached where these exist, for the purpose of showing greater and less periods of time. The clock-weight may be considered in the light of a

self-moving power, and the principal use of all the machinery of the clock-work is only to regulate the descent of the weight. Quere—Is it not possible to cause a weight of this kind to fall equably, and with no greater velocity than that of a clock-weight, without the host of complicated apendages which go towards the construction of a clock? and if so, how much simpler, more independent of change by weather and climate and more correct for astronomical calculations, would not such a time-keeper be for the study and the laboratory than any clock now in use?

As the machinery of a clock retards the weight, and makes it descend equably, it is possible to get a falling body under this species of control; and were the cord attached to a falling body, wound round a revolving cylinder only, the descent would be retarded, and more so were it wound round two cylinders; the medium the weight might be made to fall in, would also retard the motion; and even in air advantages could be taken of the extent of surface and shape of the weight. Many contrivances, it is presumable, could be resorted to for the purpose, which the mechanist is well aware of, to regulate the descent and limit the space; while an index-hand, projecting from any part of the weight, and pointing to a scale situated vertically beside it, would tell hours and minutes as correctly as the hands of a clock. To avoid the errors in time attendant on drawing up the weight, any watch, beating seconds, would give the number of seconds on the index, to which alone, of the entire scale, the gnomen should be drawn up to.

Should these speculations not be unworthy a place in the Mechanics' Magazine (to which I am indebted for much information) your giving them publicity in one of its pages will oblige your constant reader, C. D. Y.

Lond. Mec. Mag.

PREPARATION OF RAZOR STROPS.

Mr. Thompson, a surgeon's instrument maker, has found that the best razor strops are thus made:

Glue a piece of common calf-skin leather on a slip of wood, and when dry rub it with a piece of French chalk—that called by mineralists steatite—then, with a piece of the finest lump black lead that can be procured; and thus proceed, using the French chalk and black lead alternately, one after the other, until a sufficient coat or bed is formed on the leather.

Lond. Mec. Mag.

MATHEMATICAL KNOWLEDGE USELESS WITHOUT PRACTICAL EXPERIENCE.

Sir,—In the very elaborate lecture of M. de Reaumur, on the Strength of Ropes, I observe one of those sensible remarks which discovers clearer ideas of the nature of things than the general style of philosophers permit us giving them the credit of being acquainted with. I beg to refer the reader, for connexion, to the paper itself. It goes on thus: "On this geometry throws no light, any farther than we make arbitrary suppositions, which consequently determine nothing." These arbitrary suppositions, this premature application to geometry and mathematics, has done incalculable injury to science. Thus the mathematician, by *his* science, announces wherein the *cause* of planetary motion consists, because the time of an eclipse happens to be discoverable by calculation and observation, as if the cause of impulse were capable of being deduced from the peculiar curve which the trajectory of a projectile describes; and, again, this assumed discovery of the cause of planetary phenomena being supposed all-sufficient to account for minor changes, all terrestrial phenomena are accounted for as effects of the same cause, and the mathematical application coinciding, in consequence of being deduced from existing phenomena, the existence of attraction is, as it were mathematically demonstrated, though, after all, it is a mere blind man's-buff guess, attraction being a name for nothing; *for, as matter is absolutely inert, to be so, and*

have the power of attracting at the same time, is utterly impossible. In the science of optics there are many most glaring instances of the arbitrary conclusions, drawn from what may be termed mathematical inferences, of the nature of bodies, of the introduction and perpetuation of error on mathematical principles.—Scarcely has the word "light" been mentioned, before the mathematical proof of the velocity of light is set down as an incontrovertible fact, which is quickly followed by an angle, expressive of the mathematical certainty of the reflection or refraction of light; while to this instant it is, and ever must remain unproven, that light is any thing substantive, or other than a state of mental consciousness. This does not arise from mathematics being productive of error, but from the physical existence and nature of things being supposed to be deducible by that sublimest of all sciences, and the only one which is founded in nature.

In the next place, the operative, unlearned mechanic imagines, that between him and the now-a-day *mathematical master*, there must be a necessarily awful difference in their conception of things; as if the latter thought in Greek or Hebrew, to which, of course, the former could never attain; and therefore he concludes that he should have no confidence in his own opinions. But what can the kingly mathematician do, without the basket-making mechanic? What has not been done already by men who were all their lives totally unacquainted with even a single proposition in Euclid? And what is the greatest mathematician, practically inexperienced, to the unlearned mechanic, who knows how to raise the most complicated fabric without applying for mechanical aid? Still the perfection of the arts consist in the man, as well as the master, being possessed of scientific knowledge, as an *appendage* to *operative* skill, instead of being operative only, or mathematical only. The mechanic is misled, if he imagine that the orders he receives are mathematically pure, and such as native genius and understanding cannnot soar to. On the contrary, let him be assured of this, that in *his* calling he can learn some, but can communicate more.

Your obedient servant,

D. Y.

Lond. Mec. Mag.

A NEW MODE OF SHAVING.

SIR,—Perhaps it may not be unacceptable to your very extensive readers to insert in your most interesting Journal, that I have discovered a most important and effective way for every man to completely shave himself, by only mixing up, with the brush, in *a prepared thick lather*, "one tea-spoonful of finely pounded best lump whiting," without the smallest danger to the razor's edge or the surface of the chin.

Perhaps the very best edge may be given to the razor, also, by throwing a pinch of whiting on a moderately oiled or soaped strop.

Your obedient servant,

THOMAS BILLINGTON.

At first, it must be confessed, a suspicion arose that this was intended for a contemporary Magazine, and was the sportive offspring of some malicious wit; but, upon second thoughts, and the name of the respectable individual becoming known, this suspicion was dismissed, and the letter sent to the printer.

It is generally conceived that the principal use of the lather in shaving is to mark the progress of the razor; and the whiting may assist in this, otherwise it does not appear what effect can be produced by it.

Sir Joseph Banks, the late President of the Royal Society, is said to have been so much struck with the quickness and pleasantness of the Portuguese shaving, as to have paid an apprentice fee to one of their barbers to be fully instructed in their mode. It is probable that they have imported their method from the East Indies, where, it is affirmed, persons are sometimes shaved while sleeping, and without their having any knowledge of the operation being perform-

ed. The editor was some years ago in the habit of being shaved by a barber who had acquired this drawing stroke, and found its pleasant effect; but if a cut had taken place, it would have been dreadful.

Lond. Mec. Jour.

DEVILLE'S CEMENT FOR GAS PIPES.

Mr. Deville, during the very extensive course of experiments which he made upon the production of oil gas, found the following lute or cement of great use, and very readily prepared.

Take any quantity of white lead, ground in linseed oil, as sold in the colour shops, and mix it with an equal bulk of plaster of Paris, kneading them well together, and at the moment of using it to join things together, add a little water to give the cement a proper consistence.

This lute or cement must only be prepared as it is wanted, and applied immediately after the admixture of the water. It sets in a few minutes, and becomes astonishingly hard in the course of a few days.

Manufacturers who are in the habit of using plaster of Paris, compose a cement similar to that known by the name of Varley's cement, by mixing this plaster with rosin and bees' wax, instead of the whiting or chalk, used by Varley. They prefer the plaster of Paris, because, having been burned, it is freer from moisture than either of those substances.

Lond. Mec. Jour.

A MODE OF BREAKING BLOCKS OF HARD LIMESTONE BY HEAT.

In the lime-works which occupy the edges of the great sub-carboniferous limestone district of Debyshire and Staffordshire, and various other places, it has long been the practice of the quarriers, after having, by partially detaching and undermining, and the driving of wedges, or by the help of blast of gunpowder, brought down from the face of the quarry large blocks of limestone on to the floor of the quarry, to there make a small fire on the top of each block; this is usually done previously to leaving work at night; a small quantity of pit coals, from a quarter to a half or three-fourths of a peck, according to the size of the block, is laid and piled up conically on a little dry wood, upon a flat part of the block of limestone, (which block sometimes requires partially turning by levers, to bring a flat part upwards,) and on leaving work, the wood is lighted, and the fires are left burning; after a while, the blocks of stone suddenly burst with loud explosions, and crack open, diverging from the fires, which usually cause the blocks in large fragments to fall quietly around the spot; but sometimes smaller fragments are dangerously projected to considerable distances; which danger, and the avoiding of delay, are the reasons for seldom lighting these fires but on leaving work at night.

Lond. Mec. Jour.

MR. HARAW'S MODE OF MAKING STEREOGRAPHIC PLATES.

The mode usually employed for forming stereographic plates has been to compose a page with the common types used in printing, but cast shorter than usual, to fix the page in an iron case, and then turning them on their face, to pour a sufficient quantity of type-metal on the lower end, so as to unite them all together in one solid mass.

As the method is attended with the trouble and expense of dressing every single character and blank, although the separate dressing is rendered useless by the after process of uniting them altogether; others, after having composed a page with the common types, have smeared their face with a fine coat of oil, and then surrounding the face of the page with a wooden frame, have flung thereon a mixture of plaster of Paris, or calcined gypsum, with a little water, which sets almost immediately, and thus forms a mould, in which a similar page may be cast at one jet, if a sufficient quantity of type-metal be used.

Mr. Haraw, instead of thus forming the mould in which he casts his plates, prepares a sufficient number of metallic matrices, in the shape of the common types; but instead of the characters being raised upon their upper face in the reversed position, his characters are sunk hollow, and in the usual position for reading. He then composes a page with these matrices, and, as their position is favourable for that operation, he corrects any errors by reading the work as it stands before him; being corrected, the matrices are firmly locked together, and an iron frame being placed round them, the necessary quantity of type-metal is melted and poured on them, and the whole page cast at once, which is then dressed ready for use.

Lond. Mec. Jour.

THE SPIRAL CANDLESTICK.

In some French farm-houses there is to be found a singular kind of candlestick, which the farmers consider as very commodious for the purpose of working in the cellars, where they make their verdigris.

The foot of these candlesticks is nothing but a block of wood, which is sometimes square and sometimes round. The stem is a worm, made of thick iron wire, which had been formed on a mandril rather thicker than the candle: the several threads being about one-tenth of an inch apart. The upper end of the wire is formed into a hook or ring, by which it may be carried, or, when necessary, hung on a nail driven in the wall. A small socket, to receive the bottom of the candle, slides up and down this wire worm, by means of a tail, which rests on the wire, and thus supports the candle at any desired height. As the candle consumes in burning, the tail of the socket is slid along the wire worm, and thus the candle is raised until the whole of it is consumed.

Lond. Mec. Jour.

ON HARDENING ROOF SLATES.

It has been proposed by a French author, Mr. Vialet, to increase the durability of roof-slates, by baking them in a kiln until they acquire a pale red colour. He affirms, that by this means they acquire such strength as to last twice the time they otherwise would, while the expense is so trifling as not to be worthy consideration.

They do not become by this baking so brittle as to be any more liable to break than before; but their hardness is increased; and as they can no longer be cut, or have holes made in them by the point of the hammer, it is necessary that they should be properly sized and pierced before they are subjected to the kiln.

Lond. Mec. Jour.

CURIOUS PROPERTY OF THE BALANCE.

Mr. Helsham has mentioned the following curious property respecting the balance.

If a person stands in one scale, and is counterpoised exactly by weights in the other scale; and he then endeavours to press the beam upwards, he will cause the scale in which he stands to descend, as though he had become heavier.

Lond. Mec. Jour.

Communications for the American Mechanics' Magazine,
Post paid, and addressed to
JAMES V. SEAMAN,
Broadway, New-York, will receive due attention.

William Van Norden, Printer.